# HIRDLS

## HIGH RESOLUTION DYNAMICS LIMB SOUNDER

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Subject/Title: H2RTP_Driver

Description/Summary/Contents

This routine inputs the appropriate data needed by the retrieval, calls the retrieval and outputs the retrieved data to a HIRPROF file

**H2RTP – "Retrieval wrapper" – The module which handles the I/O for the science retrieval routines.**

Keywords:

Purpose of this Document:

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EOS

# H2RTP_Driver

This routine inputs the appropriate data needed by the retrieval, calls the retrieval and outputs the retrieved data to a HIRPROF file

Open and verify the Control file (used to control the retrieval) – *H2RTP_OpenControl* and *H2RTP_VerifyControl*

Open the rest of the files needed by the retrieval –*H2RTP_OpenRetFiles*

Check that the collocated times/lats/lons are within epsilon of the times/lats/lons in the HIRRAD file – *H2RTP_ChkColocTimeLatLon*

Determine the indices for the StartProfileID and StopProfileID – *SWATH_GetProfileIndex*

If no profiles within the start/stop profiles

     close all files  - *H2RTP_ClsRetFiles*

     exit with an error

Read in the HIRRAD data and put data in the H2RSS_instr, H2RSS_ToaAllProfiles, H2RSS_meas, H2RSS_LevHgt structures – *H2RTP_ReadRad*

If requested, read in the collocated GMAO data and put data in the H2_GMColoc structure – *H2RTP_ReadCLCG*

Read in the HIR2LSGW data and put data in the H2LSP_Dat structure – *SWATH_HIR2LSGW_ReadStatic*

If 'SIMULATE', 'WGTFNPTB' or 'ERRAVCLC' then simulate data – *H2RTP_RetBlkForSim*

If 'RETRIEVE' then retrieve the data – *H2RTP_RetBlkForRet*

Close all files – *H2RTP_ClsRetFiles*

## *Subset of a retrieval control file*

* Driver file details
20100421 HIRDLS retrieval driver for all products, Stage 1 (FM1), retrieval/radiance ranges in level (not P), all ctm M

* Retrieval ON/OFF flag

ON

* Retrieval comment string

Retrieving T,p from Channels 02,03,04,05

* Runmode : SIMULATE RETRIEVE

RETRIEVE

*

* USE_PREV_PRF : use previous profile for 1st guess

0

*

* Diagnostic level outout : ALLDIA GOODDIA BADDIA SAMPDIA NODIA

NODIAG

* LOS option

LSG

* CLDRET option (T = retrieve through select clouds)

F

* FM option : FM1 (old pseudo-regression FM) or FM2 (new regression FM)

FM1

*

1 4 20 0.1 95.0 G M   ! #products | channel no.s | #max iter | conv param | k2 conf lvl | TPSREQ | H2OCREQ |

8 1.0E-4            ! forward model pressure limits (currently not used in L2)

CO2 8 119 C 5.0      ! product | retrieval level limits | prod src req | apr cov len scl |

02 8 119 5           ! channel no. | radiance level limits | #contaminants |

  H2O   M           ! contam id | contam src req |

  O3    M

  N2O   M

  N2O5  M

  AERO02 M

03 8 119 4           ! channel no. | radiance level limits | #contaminants |

  H2O   M

  O3    M

  N2O   M

  AERO03 M

04 8 119 4           ! channel no. | radiance level limits | #contaminants |

  H2O   M

  O3    M

  N2O   M

  AERO04 M

05 8 119 3           ! channel no. | radiance level limits | #contaminants |

  H2O   M

  O3    M

  AERO05 M

* Retrieval ON/OFF flag

ON

* Retrieval comment string

Retrieving H2O from Channels 18,20

* Runmode : SIMULATE RETRIEVE

RETRIEVE

*

* USE_PREV_PRF : use previous profile for 1st guess

NODIAG

* LOS option

LSG

* CLDRET option (T = retrieve through select clouds)

F

* FM option : FM1 (old pseudo-regression FM) or FM2 (new regression FM)

FM1

*

1 1 20 0.1 95.0 g M   ! #products | channel no.s | #max iter | conv param | k2 conf lvl | TPSREQ | H2OCREQ |

8 1.0E-4          ! forward model pressure limits (currently not used in L2)  |

H2O18 8 55  C 5.0      ! product | retrieval level limits | prod src req | apr cov len scl |

18 8 55  4          ! channel no. | radiance level limits | #contaminants |

  CO2   M          ! contam id | contam src req |

  CH4   M

  O2    M

  AERO18 M

# H2RTP_OpenRetFiles

Open and create all of the remaining files required by the retrieval

Open the HIRRAD file for reading and read the lat/lon/time/ProfileID information

If required, open the HIR2CLCM file (collocated model file)

If required, open the HIR2CLCG file (collocated GMAO file)

If the runmode is 'RETRIEVE', 'SIMULATE', 'ERRAVCLC' or 'WGTFNPTB'

    If a new HIRPROF is requested (output HIRDLS profiles on altitude grid)

        Create a HIRPROF file using the HIRPROF definition file

    Else

        Open an existing HIRPROF file


Open HIR2CLCA file (collocated apriori file)

Open HIRRETD file (retrieval diagnostic file – used for debugging purposes only)

If runmode is 'SIMULATE', 'ERRAVCLC' or 'WGTFNPTB'

    Create HIRRDSIM file (simulated radiance file with noise)


If runmode is 'SIMULATE', 'ERRAVCLC' or 'WGTFNPTB' or (runmode is 'RETRIEVE' and a HIRRADFIT file is requested)

    Create HIRRDSYN file (simulated radiance file without noise)

Else if HIRRADFIT is 'ADD'

    Open existing HIRRDSYN file

Open HIR2LSGW file (line of sight weights file)

Open HIR2TRA file (transmittance table file)

Open HIR2CLCC file (collocated climatology file)

If requested, create the HIR2LOS2D file (LOS2D structure snapshot file)

# H2RTP_RetBlkForSim

This routine simulates the HIRDLS radiances given a gridded atmosphere and lat/lon/time locations for HIRDLS measurements.

Throughout the routine, it checks run and profile status:

> If a run error has been set, write an error message and exit the routine

> If a profile error has been set, write an error message and cycle to the next profile

Loop over retrieval blocks

> Load in one retrieval block's control file information and load the information into the H2RSU_Control structure – *H2RTP_LoadControl*

> Set up indexing of the arrays, assigning control directives to the H2RSS_DrvDat structure – *H2RSU_StpIdx* (this routine is outside the scope of this writeup)

> Read in the tabulated data: spectral filter data, band-averaged transmittance data, independent gas approximation data, channel integrated Planck function, and temperature derivative function data – *H2RLD_LoadData*

> Map the fieldnames from the H2RSS_DrvDat structure to the local array fieldnames (in control file order) – *H2RTP_FieldNameMap*

> Read the HIR2CLCC file – *H2RTP_ReadColoc*

> Read the HIR2CLCM file, if requested – *H2RTP_ReadColoc*

> Read the apriori data – *H2RTP_GetApriori*

> Read the HIRPROF data, if requested – *SWATH_ReadHeader, SWATH_HIRPROF_ReadStatic and SWATH_ReadDynam2D*

> Assign a random seed for generation of simulated noise data – *H2RRN_AssignRndSeed*

> Loop over profiles from StartProfileIndex to StopProfileIndex

>> Assign the detector noise to the measurement error field

>> Assign multi-profile data to single profile H2RSS_LevHgt, H2RSS_AprPrf, H2RSS_Meas and H2RSS_Toa data structures – *H2RTP_AssignProfiles*

>> Perform Line of Sight calculations – *H2LSP_Main*

>> If requested, write out the diagnostic Line of Sight information – *H2RTP_WriteLSG*

>> Finds the topmost cloud in each profile and sets all points below it to cloudy – *H2RTP_PSCCldSet*

Sanity check the data being passed to ROE for NaNs, missing values and proper ranges – *H2RTP_CheckData*

Call the retrieval, adding two additional optional parameters which are needed for the simulation– *H2ROE_Main* (documenting this routine is outside the scope of this write-up)

Assign the simulated data to the output structures (both simulated radiances with and without noise, as well as jitter error)

End loop over profiles

If writing HIR2LOS2D diagnostic file

Close the file

Move the file adding the retrieval block number to the name

Create the next block's HIR2LOS2D file

Write out the simulated data(with and without noise) to the HIRRDSYN file and HIRRDSIM – *H2RTP_WriteRad*

End loop over retrieval blocks

# H2RTP_RetBlkForRet

Loop over retrieval blocks and profiles, performing retrievals on each profile

Throughout the routine, it checks run and profile status:

> If a run error has been set, write an error message and exit the routine

> If a profile error has been set, write an error message and cycle to the next profile

Loop over retrieval blocks

> Load in one retrieval block's control file information and load the information into the H2RSU_Control structure – *H2RTP_LoadControl*

> Set up indexing of the arrays, assigning control directives to the H2RSS_DrvDat structure – *H2RSU_StpIdx*  (this routine is outside the scope of this writeup)

> Read in the tabulated data: spectral filter data, band-averaged transmittance data, independent gas approximation data, channel integrated Planck function, and temperature derivative function data – *H2RLD_LoadData*

> Create the product retrieval list (setting it to Temperature and Pressure if "CO2" is requested)

> Map the fieldnames from the H2RSS_DrvDat structure to the local array fieldnames (in control file order) – *H2RTP_FieldNameMap*

> Read the HIR2CLCC file – *H2RTP_ReadColoc*

> Read the HIR2CLCM file, if requested – *H2RTP_ReadColoc*

> Read the apriori data – *H2RTP_GetApriori*

> Read the HIRPROF data, if requested – *SWATH_ReadHeader*, *SWATH_HIRPROF_ReadStatic* and *SWATH_ReadDynam2D*

> Loop over profiles from StartProfileIndex to StopProfileIndex

>> If there are no radiances in the this profile, cycle to the next profile

>> For every channel using, make sure all of the data is non-missing, otherwise cycle to the next profile

>> Assign multi-profile data to single profile H2RSS_LevHgt, H2RSS_AprPrf, H2RSS_Meas and H2RSS_Toa data structures – *H2RTP_AssignProfiles*

>> Perform Line of Sight calculations – *H2LSP_Main*

If requested, write out the diagnostic Line of Sight information – *H2RTP_WriteLSG*

Finds the topmost cloud in each profile and sets all points below it to cloudy – *H2RTP_PSCCldSet*

Sanity check the data being passed to ROE for NaNs, missing values and proper ranges – *H2RTP_CheckData*

Call the retrieval – *H2ROE_Main*        (documenting this routine is outside the scope of this writeup)

Assign the retrieved  data and its error fields to the output structures

End loop over profiles

If writing HIR2LOS2D diagnostic file

Close the file

Move the file adding the retrieval block number to the name

Create the next block's HIR2LOS2D file

Write the retrieval data to the HIRPROF file – *H2RTP_WriteProf*

If requested, write out the simulated data to the HIRRDSYN file – *H2RTP_WriteRad*

End loop over retrieval blocks